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EXAMINER

ZERVIGON, RUDY

ART UNIT

PAPER NUMBER

1763

7

DATE MAILED: 12/26/2001

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/667,770

Applicant(s)

KOMINO ET AL.

Examiner

Rudy Zervigon

Art Unit

1763

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) Responsive to communication(s) filed on 22 September 2000.
 2b) This action is non-final.
 2a) This action is FINAL.
 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) Claim(s) 1-31 is/are pending in the application.
 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
 5) Claim(s) _____ is/are allowed.
 6) Claim(s) 1-4,7-10,13,15,19-22,25 and 27-31 is/are rejected.
 7) Claim(s) 5,6,11,12,14,16-18,23,24,26 and 28 is/are objected to.
 8) Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) The specification is objected to by the Examiner.
 10) The drawing(s) filed on 22 September 2000 is/are: a) accepted or b) objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 11) The proposed drawing correction filed on _____ is: a) approved b) disapproved by the Examiner.
 If approved, corrected drawings are required in reply to this Office action.
 12) The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

Priority under 35 U.S.C. §§ 119 and 120
 13) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

- a) All b) Some * c) None of:

1. Certified copies of the priority documents have been received.

2. Certified copies of the priority documents have been received in Application No. _____.

3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14) Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) The translation of the foreign language provisional application has been received.

15) Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) Notice of References Cited (PTO-892)
 2) Notice of Draftsperson's Patent Drawing Review (PTO-948) ✓ ✓
 3) Information Disclosure Statement(s) (PTO-1449) Paper No(s) 4_6

- 4) Interview Summary (PTO-413) Paper No(s). _____
 5) Notice of Informal Patent Application (PTO-152)
 6) Other:

Application/Control Number: 09/667,770

Art Unit: 1763

DETAILED ACTION

Drawings

1. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include the following reference sign mentioned in the description: "gas grooves 200" (page 30, lines 3, 7, 33...) is not shown in any of "Figures 9A through 9D". Correction is required.

Application/Control Number: 09/667,770

Art Unit: 1763

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.
2. Claims 3-5 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claims 3-5 require an "insulating member" yet such a term is indefinite because "insulating" members can either be thermally insulating or electrically insulating members.
3. Claim 4 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claims 4 requires a material with a specific value for thermal conductivity yet does not specify a temperature for that value of thermal conductivity¹.
4. Claims 7, 27 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The units given for surface roughness "im" does not correspond to acceptable units as demonstrated by page 33, line 21 of the specification.
5. Claims 8, 21 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The term "low" melting point is a relative term rendering the claim indefinite.
6. Claims 9, 10, 22 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant

¹ CRC Handbook of Chemistry and Physics, Robert C. Weast (Ed.), 63rd Ed. 1982-1983; P. E-9

Application/Control Number: 09/667,770

Art Unit: 1763

regards as the invention. The term "soft", "softened", and "low" are relative terms rendering the claim indefinite.

Application/Control Number: 09/667,770
Art Unit: 1763

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1-3, 4², 7-10, 13, 19-22, 25, and 27-31 are rejected under 35 U.S.C. 102(b) as being anticipated by Ueda et al (U.S.Pat. 5,376,213) as demonstrated by Robert C. Weast³. Rice et al teaches:

1. An electrode structure (Figure 2) used in a plasma processing apparatus (Figure 1) which performs a predetermined process (column 1, lines 45-50) on an object ("W") to be processed by using a plasma in a process chamber (4; Figure 1) in which a vacuum can be formed, the electrode structure is characterized by comprising: an electrode unit (54; Figure 2) having a heater unit (52; Figure 2) therein; a cooling block (10; Figure 2) joined to the electrode unit and having a cooling jacket (80; Figure 2) which cools said electrode unit; a heat resistant metal seal member (53a,b; 11a; Figure 2 **176; Fig.6; column 9, lines 59-65**) for sealing an electrode-side heat transfer space (82, 16, 30; Fig.2) formed between said electrode unit and said cooling block; and electrode-side heat transfer gas supply means (32a, Fig.2) for supplying a heat transfer gas to said electrode-side heat transfer space.

2. An electrode structure used in a plasma processing apparatus which performs a predetermined process on an object ("W") to be processed by using a plasma in a process chamber (4; Figure 1) in which a vacuum can be formed, the electrode structure is characterized by comprising: an electrode unit (54; Figure 2) having a heater unit (52; Figure 2) therein; a cooling block (10; Figure 2) joined to the electrode unit and having a cooling jacket (80; Figure 2) which cools said electrode unit; a labyrinth heat transfer space (30; Fig.2) formed by a concentric or spiral groove provided on at least one of opposite surfaces of said electrode unit and said cooling block; and electrode-side heat transfer gas supply means (32a, Fig.2) for supplying a heat transfer gas to said labyrinth heat transfer space.

3. The electrode structure as claimed in claim 1 or 2, characterized in that an insulating member (54; Fig.2) is provided between said electrode unit (54; Figure 2) and said cooling block (10; Figure 2), and said heat transfer space (82, 16, 30; Fig.2) is divided into an upper space (30; Fig.2) and a lower space (16, 82; Fig.2) by the insulating member.

² CRC Handbook of Chemistry and Physics, Robert C. Weast (Ed.), 63rd Ed. 1982-1983; P. E-9

³ MPEP 2116.01

Application/Control Number: 09/667,770

Art Unit: 1763

4. The electrode structure as claimed in claim 3, characterized in that said insulating member (54; Fig.2) is made of a material having a coefficient of thermal conductivity of more than 80 W/mK ("aluminum"; column 4, lines 10-25; 100W/mK = 1W/cmK).

7., 27. - The electrode structure as claimed in claim 1 or 2, characterized in that a surface roughness of a member (172; column 10, lines 8-15) defining said heat transfer space ("S"; Figures 6,7,8a,8b) is smaller than 2.0 μm (column 10, lines 8-15).

8. The electrode structure as claimed in claim 1, characterized in that said heat resistant metal seal member (11a,b; 53a,b) is a heat resistant metal film (176; column 9, lines 32-65) having a ring-like cross section (Figures 6,7,8a,8b), a low melting point material (column 6, lines 59-65) being confined in the metal film (176; column 9, lines 32-65).

9. The electrode structure as claimed in claim 1, characterized in that a surface of said heat resistant metal seal member (11a,b; 53a,b) is covered by a soft metal film (176; column 9, lines 32-65) made of a low melting point material which is softened at a process temperature of said object ("W") to be processed.

10. The electrode structure as claimed in claim 1, characterized in that a surface of a member contacting said heat resistant metal seal member (11a,b; 53a,b) is covered by a soft metal layer made of a low melting point material which is softened at a process temperature of said object ("W") to be processed.

13. The electrode structure as claimed in claim 1 or 2, characterized in that said heater unit (52; Figure 2) is a ceramic heater (column 4, lines 11-25).

19, 29. The electrode structure as claimed in claim 1 or 2, characterized in that the center of said electrode unit (54; Figure 2) is held by a column (34), and the column is connected to said cooling block (10; Figure 2) via a heat conductive member.

20. A placement table structure (Fig.2) used for a processing apparatus performing a predetermined process on an object ("W") to be processed in a process chamber (4; Figure 1) in which a vacuum can be formed, the placement table structure is characterized by comprising: a placement table having a heater unit therein so as to heat said object to be processed; a cooling block joined to the placement table and having a cooling jacket which cools said placement table; a heat resistant metal seal member for sealing a heat transfer space formed between said placement table and said cooling block; and heat transfer gas supply means for supplying a heat transfer gas to said heat transfer space.

21. The placement table structure as claimed in claim 20, characterized in that a surface of said heat resistant metal seal member is covered by a soft metal film (176; column 9, lines 32-65) made of a low melting point material which is softened at a process temperature of said object ("W") to be processed.

Application/Control Number: 09/667,770

Art Unit: 1763

22. The placement table structure as claimed in claim 20, characterized in that a surface of a member contacting said heat resistant metal seal member is covered by a soft metal layer made of a low melting point material which is softened at a process temperature of said object ("W") to be processed.

25. A placement table structure (Fig.2) used for a processing apparatus performing a predetermined process on an object ("W") to be processed in a process chamber (4; Figure 1) in which a vacuum can be formed, the placement table structure is characterized by comprising: a placement table having a heater unit therein so as to heat said object to be processed; a cooling block joined to the placement table and having a cooling jacket which cools said placement table a labyrinth heat transfer space (30; Fig.2) formed by a concentric or spiral groove provided on at least one of opposite surfaces of said placement table and said cooling block; and heat transfer gas supply means for supplying a heat transfer gas to said labyrinth heat transfer space.

30. A plasma processing apparatus characterized by comprising: a process chamber (4; Figure 1) in which a vacuum can be formed; an electrode structure (14, Fig.2) recited in one of claims 1 to 19; and a high-frequency source (38) applying a high frequency voltage to the electrode structure (column 3, lines 29-35).

31. A processing apparatus characterize by comprising: a process chamber (4; Figure 1) in which a vacuum can be formed; and a placement table structure (Fig.2) recited in one of claims 20 to 29.

Application/Control Number: 09/667,770

Art Unit: 1763

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ueda et al (U.S.Pat. 5,376,213) as applied to claims 1-3, 4⁴, 7-10, 13, 19-22, 25, and 27-31 above, and further in view of Mase et al (U.S.Pat. 5,169,407). Ueda et al does not teach the electrode structure as claimed in claim 1 or 2, characterized in that said electrode unit (54; Figure 2) is an upper electrode unit positioned above said object ("W") to be processed. However, Mase et al teaches an electrode structure characterized in that the electrode unit (10; Figure 1) is an upper electrode unit positioned above the object ("semiconductor substrate"; column 3, lines 10-11) to be processed.

It would have been obvious to one of ordinary skill in the art to implement the Mase et al electrode structure as part of the Ueda et al processing apparatus characterized in that the electrode unit is an upper electrode unit positioned above the object ("semiconductor substrate"; column 3, lines 10-11) to be processed.

Motivation for implementing the Mase et al electrode structure as part of the Ueda et al processing apparatus where the electrode unit is an upper electrode unit positioned above the

⁴ CRC Handbook of Chemistry and Physics, Robert C. Weast (Ed.), 63rd Ed. 1982-1983; P. E-9

Application/Control Number: 09/667,770

Art Unit: 1763

object ("semiconductor substrate"; column 3, lines 10-11) to be processed is drawn to

"uniformity of the thickness of a plasma CVD film" (column 1, lines 56-63).

Allowable Subject Matter

5. Claims 5, 6, 11, 12, 14, 16-18, 23, 24, 26, 28 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Regarding claim 16 - Ueda et al teaches a heat transfer space (30) formed below, not between, said electrostatic chuck (22) and said object (W) to be processed.

Application/Control Number: 09/667,770

Art Unit: 1763

Conclusion

6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. U.S.Pat. 5,062,386; 6,048,434; 5,961,774; 5,792,304; 6,214,162; 6,095,083; D.R.Write, et al, "Low temperature etch chuck: Modeling and experimental results of heat transfer and wafer temperature"; J.Vac. Sci. Technol. A 10(4), Jul/Aug, 1992. pp.1065-1070
7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner Rudy Zervigon whose telephone number is (703) 305-1351. The examiner can normally be reached on a Monday through Thursday schedule from 8am through 7pm. The official after final fax phone number for the 1763 art unit is (703) 872-9311. The official before final fax phone number for the 1763 art unit is (703) 872-9310. Any Inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Chemical and Materials Engineering art unit receptionist at (703) 308-0661. If the examiner can not be reached please contact the examiner's supervisor, Gregory L. Mills, at (703) 308-1633.


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